Digital Audio Broadcasting: Looking To The Future

A World Perspective—And Status In The USA

by D. Prabakaran

Digital Audio Broadcasting (DAB) has the potential to transform the traditional audio-based radio medium into a full fledged *multimedia* system, particularly suited to bringing digital information to the general public, anywhere and anytime. Digital radio has already become a reality in many European countries. It's now possible to enjoy digital radio via various platforms, including DAB.

It's vital for the success of DAB to work in harmony and synergy with some other systems, particularly those in the communication and Internet sectors. And it's clear that DAB has to *share* the market and compete with other digital radio delivery systems like Wi-Fi, telematics devices, and the Internet.

DAB technology was developed by the Eureka-147 DAB Project, which was set up in 1987. The Project ended in 1999 as a stand-alone organization and merged with the WorldDAB Forum. Since 2000, the WorldDAB Forum has been responsible for the technical maintenance of the EU-147 standard. The Forum, comprised of 90 countries and several manufacturers, is now a central body for ensuring international promotion and marketing of the DAB system worldwide as well as lobbying international bodies such as the European Commission, European Parliament, and the CEPT (Committee Europeene des Postes et Telecommunications) for frequency spectrum management issues.

Better Sound Quality—And More

Whereas international cooperation is ensured by the WorldDAB Forum, the actual rollout of DAB services is in the hands of national broadcasters and national governments. Now that all major broadcasters and consumer electronics manufacturers have adopted it, DAB seems to have begun moving beyond the early stages. From the technology perspective, the value of DAB lies in better sound quality, more efficient use of the frequency spectrum, and the ability to carry additional data (non-audio) services, either associated with the main radio program, or not.

The real-world implementation of DAB has been affected by the increasingly difficult political and economic situation in many countries. Many radio broadcasters have been facing financial problems and have had insufficient funding available to invest in the DAB transmitter network infrastructure, new production facilities, and multimedia programming.

The public's attention recently has been more focused on the auctioning of telecom spectrum and the bursting of the Internet bubble than on DAB rollout. Today, DAB has to face competition from other digital broadcasting systems, along with new communications, Internet, and storage technologies that can also provide some types of audio and radio services. Consumers are overwhelmed by buzz words such as DVD, ADSL (Asymmetric Digital Subscriber Line, a form of DSL), Wi-Fi, digital music players, memory sticks, digital video and photo cameras, advanced mobile phones, and PDAs.

In Europe, PURE Digital (a division of Imagination Technologies) sells this portable DAB receiver, the Evoke 2, touted as an affordable and easy-to-use receiver.

On the other hand, analog FM and AM radio services still enjoy huge popularity. They can still satisfy the expectations of millions of keen listeners interested in listening to the news, music, and radio drama. To compete with these other technologies, a lot of system developments are *added* to DAB.

Why DAB?

DAB was originally developed to provide enhanced mobile radio reception, but it's now also an excellent mobile *multimedia* system able to deliver data and telematics to users at home and on the move, such as emergency warnings via real-time traffic and travel information. Easy-to-use receivers and tuning by frequency name are key benefits from a safety point of view. Improved sound quality and lack of interference when mobile is a huge advantage to any car owner, as are the value-added services which can be offered via digital radio DAB receivers. These are highly complementary to existing multimedia systems and can also be fully integrated with vehicle navigation systems, allowing for a complete infotainment package.

DAB Digital Radio provides motorists with a range of benefits that meet the current and likely future demands of both dri-

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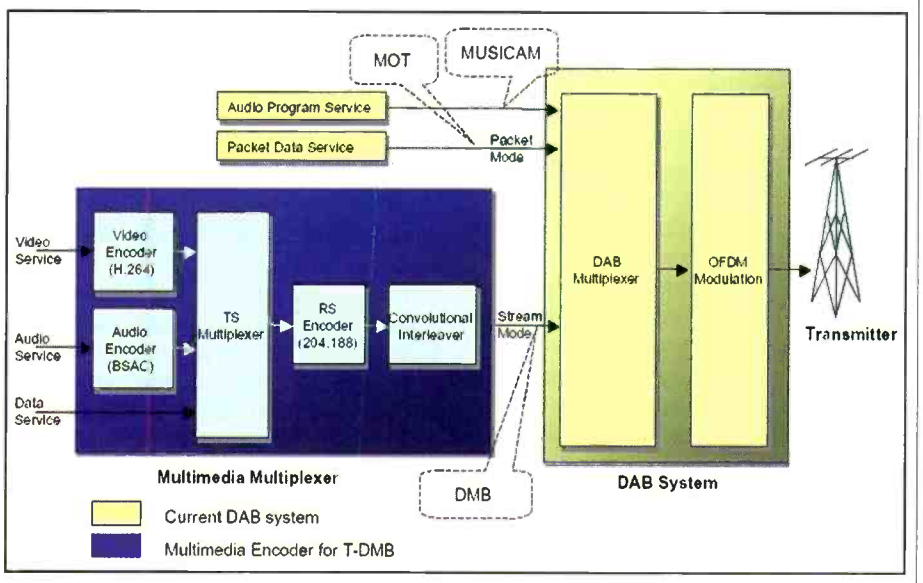

Multimedia transfer in the Eureka-147 system.

vers and passengers with the latest in in-car entertainment and services. The "Mr. Taxi-Smart" Project, currently undergoing trails in Singapore, is an *interactive* point-of-information and advertisement system specifically designed for taxis using DAB technology. An LCD screen with integrated DAB module enables passengers to access real-time information and on-demand data services including traffic reports, sports and financial news, tourism and shopping information, as well as their favorite Smart Radio station.

Data And Text Capability

Stations that have converted their transmission systems to HD Radio are capable of transmitting text messages, which will be displayed on HD Radio-compatible receivers. Initially, FM broadcasters will be able to send out what's known as program associated data (PAD), typically song title and artist name. Listeners—viewers—will soon be seeing text advertisements and station branding-program name, slogans, and other promotional messages to help build listener loyalty. In the future, broadcasters may want to add extra information such as album name and year and artists' biographies to their display broadcasts. Text feeds of breaking news, weather, sports information, traffic updates and more are all possible, completely revolutionizing radio as we know it today!

Kenwood's HD Radio Tuner, the KTC-HR100-TR, is compatible with Tomorrow Radio, Analog, and Digital FM/AM Radio with supplemental channel. It provides song title, artist, and other content information via Kenwood In-Dash receivers.

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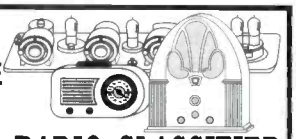

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Data services enabled by HD Radio are not limited to on-screen text displays, though. Using a feature called data tunneling, which transmits data for special non-broadcast applications, broadcasters can send their listeners the latest traffic information for their in-car navigation systems to help them avoid delays due to accidents or road construction. Future developments could include images, such as album art and other file-based services, as well as the transmission of information services as data streams or file transfer.

Digital Radio's Status In The USA

Since *Pop'Comm* most recently reported to you (in June) about digital radio, there have been significant developments.

HD Radio is iBiquity's brand of digital radio technology for transmission and reception of sound that has been digitized and compressed, and the FCC has selected it as the standard for local area broadcast of signals within the United States. It offers multiple programs on one channel and works on the same frequencies allocated to analog (FM and AM) radio stations. Supporters and avid listeners claim CD quality sound and reduced interference.

Today there are more than 750 AM and FM stations in the United States broadcasting with digital HD Radio technology, with an additional 2,000-plus stations in the process of upgrading to the HD Radio system, according to industry experts (visit www.radiosophy.com/abouthdradio/hd_radio_map.html.It for an HD Radio U.S. coverage map).

After a lackluster rollout from both radio stations and manufacturers earlier this year, digital radio is finally gaining some traction in United States. Hundreds of radio stations have gone digital in recent months, and retailers are starting to offer digital radios for homes as well as cars—slowly.

HD Radio technology remains the only digital broadcast system approved by the FCC for AM and FM radio in the United States. And it's rapidly transforming AM and FM radio stations to digital, enabling dramatically improved sound, crystal-clear reception, and advanced new applications like HD2 multicasting, a feature which allows FM stations to broadcast multiple streams of unique programming over a *single* frequency. HD receivers incorporate this advanced "secondary audio" capability and are able to receive multiple programming streams, single digital signals, as well as analog signals.

Since these channels ride on top of the analog station's licensed channel, no additional spectrum is required. This makes multicasting an appealing option for broadcasters who would like to offer new programming but, until now, were limited by the availability of licensed frequencies. Within broadcasters' existing frequency bands, stations that transmit multiple programs can allocate fewer or larger numbers of "digital bits" to each programming channel. Bandwidth may soon be dynamically modifiable during different dayparts (broadcast lingo for times of the day). Reading services for the blind and other public programming being broadcast as an FM side-channel using a separate frequency and a special receiver are prime candidates for multicasting.

Other stations are adding program channels complementary to the main program service. Examples include an oldies format station that multicasts a Beatles-only companion channel and a news station that multicasts its programming in Spanish, plus dedicates another channel to traffic updates. Another station is broadcasting two music channels of the same format, but with one for an older audience and the other for a younger demographic. Several program providers in the United States are about to launch services for stations' supplemental channels to ease the implementation of multicasting.

NPR Leads The Way With The Tomorrow Radio Project

National Public Radio is pioneering this secondary audio capability with its recently announced Tomorrow Radio Project, which will offer its member stations a selection from four new NPR HD Radio program feeds covering music and news/talk. The stations will be able to select one of these as their secondary channel. The Project is a multi-year undertaking that will test and demonstrate new digital technologies and services to operate within HD Radio system. Kenwood USA and Harris Corporation have agreed to join the first testing team under the project. A principal goal of Tomorrow Radio is to test multi-channel or "second audio" technology that could allow public radio stations to broadcast more programming and content using their existing spectrum.

Competition With Satellite Radio

Broadcasters are touting HD Radio as an alternative to satellite radio. It's different from fast growing satellite services, which currently serve about six million subscribers. XM Satellite Radio and Sirius Satellite Radio also beam their signals digitally, but do so via satellite and offer a national service of 100 or so mostly commercial-free channels for $10 to $13 a month. HD Radio and its HD2 sister technology offer many of the same features of satellite radio, including clearer sound and more varied programming, but it's *free*.

HD Radio is not a subscription service like satellite radio. It comes over the airwaves just like today's AM and FM radio. It compliments conventional radio to give listeners another important choice—at no cost. And programming options will increase greatly with the introduction of HD2, which as previously mentioned, allows for multiple broadcasting options from a single frequency.

Satellite companies aren't sitting still, however. In March, Washington, D.C-based XM Satellite Radio, Inc., introduced two channels that broadcast music in XM HD Surround, a technology similar to home-theater surround sound.

Not Without Criticisms

The HD Radio system has not been immune to criticism. Many find the claims of higher audio quality exaggerated, or even untrue when multicasting is used as individual channel rates are reduced. Some report hearing a decrease in audio quality on the analog signal of stations that have taken up the system. Another criticism is its portability. HD Radios consume much more power than portable MP3 players, making battery life a major problem. Also, if a listener is on the fringe of a station's signal, the digital signal may not be heard at all; there won't be the fading in and out that is so commonly experienced by listeners as they drive in and out of range of one FM radio station signal to the next.

The good news for listeners, though, is that all HD Radio receivers will be equipped with AM/FM receivers, too. This dual functionality will allow listeners to continue to pick up an analog FM signal when the digital signal is too weak.

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There are also various marketing-related challenges that HD must overcome. Overall, as of mid-2006 consumers have shown very little interest in HD Radio. Reasons cited have included the expense and difficulty of replacing existing radio receivers, a lack of compelling content, and no significant difference in signal quality between standard FM broadcasting and HD Radio streams. The content issue has been somewhat addressed by the increasing use of secondary ("HD2") streams, but receiver demand remains rather low.

Receiver Availability

Receivers have been available from online retailers since late 2005. Manufacturers have initially focused on making car stereos, with BMW being the first to announce HD Radio as an option for the company's 2006 7-series, 6-series, and 5-series models. More than 30 models of automobiles will ship with HD Digital Radios by the 2008 model year.

Home listening equipment is available in both home tuner and tabletop models. They're becoming less expensive, starting at around $100 to $150 (the Kenwood Tuner, for use with Kenwood stereos, is selling for as little as $98). HD digital radio receivers are currently manufactured by more than 15 companies, including Audio Design Associates, Kenwood, Alpine, Panasonic, Boston Acoustics, Polk, Day Sequerra, Radiosophy, Delphi, Rotel, DICE, Sanyo, Eclipse (Fujitsu), JVC, and Visteon. More than 20 Asia-based manufacturers have HD Digital Radio receivers in development.

"Radio is at a crucial period in its development, and needs to reposition itself to become a modern communications medium, attracting existing and new radio users, particularly young people."

The equipment is currently available from ABC Warehouse, Alamo Electronics, Audio Adviser, B&B Appliance, Bjorn's Stereo Designs, Car Toys, Crutchfield.com, eCost.com, Electronics Expo, Flanner's Audio & Video, Great Indoors (a unit of Sears Roebuck & Co.), Hammacher Schlemmer.com, Harvey's, Hi-Fi Buys, Home Entertainment, Huppins Hi Fi, J & R Music, Listen Up, Magnolia Audio Video, One Call, Ovation AV, Pyramid Audio, Rudy's Autosound, Sound Advice, Spearit Sound, Tweeter and World of Sound. Links to national retailers selling HD Digital radios are at www.hdradio.com.

Change Is Here Now!

Radio is at a crucial period in its development and needs to reposition itself to become a modern communications medium, attracting existing and new radio users, particularly young people. DAB will surely face many challenges and vigorous competition from digital television, wireless networks, and broadband. The channel coding and modulation scheme chosen for DAB has been demonstrated to provide a robust and efficient way of delivering digital information, both to in-vehicle receivers and portable or fixed receivers.

What's the future of DAB in the United States? We'll be sure to follow the developments so stay tuned. And write in to let us know what *you* think about HD Radio. This is truly a radio revolution—and you're a witness to history being made with all that DAB technology has to offer! ■